

Thermal Diffusivity of the Aluminum Alloy Al-17 Si-4 Cu (A390) in the Solid and Liquid State

E. Kaschnitz^{C,S}

Oesterreichisches Giesserei-Institut, Leoben, Austria

kaschnitz.ogi@unileoben.ac.at

R. Ebner

Materials Center Leoben, Leoben, Austria

The thermal diffusivity of the aluminum alloy Al-17Si-4Cu (A390) in the temperature range from room temperature to 750 °C was measured using the laser flash technique. This alloy is typically used for engine blocks and pistons for high performance racing cars or luxury cars. The thermal diffusivity data are required for numerical simulation of castings within the production process of engine blocks.

A commercial laser flash system (NETZSCH) was used for measurements. A short laser pulse of 300 µs was applied to heat the bottom surface of a disk shaped specimen, resulting in a time-dependent temperature increase at the top surface. A correction for the laser pulse-length and the surface radiation was applied in order to evaluate the half time value of the temperature increase. Thermal diffusivity was calculated from the specimen thickness and the half time value.

A sapphire crucible was used to contain the specimen in the mushy region and in the liquid state. As the laser is firing from below at the bottom surface of the specimen, the thickness of the melt has to be relatively small to avoid buoyancy. The influence on specimen thickness and the applied laser pulse-length correction was investigated. The thermal diffusivity in the liquid is drastically lower than in the solid state of the alloy.